

# German Antarctic Receiving Station (GARS) O'Higgins

*Alexander Neidhardt, Christian Plötz, Thomas Klügel*

## Abstract

In 2012 the German Antarctic Receiving Station (GARS) O'Higgins contributed to the IVS observing program with 4 observation sessions. Maintenance and upgrades were made. A new replacement dewar is under construction in the observatory Yebes, Spain.

## 1. General Information

The German Antarctic Receiving Station (GARS) is jointly operated by the German Aerospace Center (DLR) and the Federal Agency for Cartography and Geodesy (BKG, belongs to the duties of the Geodetic Observatory Wettzell (GOW)). The Institute for Antarctic Research Chile (INACH) coordinates the activities and logistics. The 9m radio telescope at O'Higgins is mainly used for downloading of remote sensing data from satellites as ERS-2 (mission ended in September 2012) and TanDEM-X as, for the commanding and monitoring of spacecraft telemetry and for geodetic VLBI. In 2012 the station was manned by DLR staff the entire year and by BKG staff only in January and the beginning of March for the VLBI observations. The VLBI campaign in November-December 2012 had to be canceled due to the reduced staffing situation. Beside engineers and operators from DLR and BKG, a team for maintaining the infrastructure (e.g. power and freshwater generation) was present all over the year.

Over the last years, special flights using "Hercules C-130"-aircrafts and small "Twin Otter DHC-6"-aircrafts as well as transportation by ship were organized by INACH in close collaboration with the Chilean Army, Navy and Airforce and with the Brazilian and Uruguayan Airforce in order to transport staff, technical material and food for the entire campaign from Punta Arenas via Base Frei on King George Island to O'Higgins on the Antarctic Peninsula. Due to the fact that the conditions for landing on the glacier are strongly weather dependent and involve an increasing risk. In general, transport of personnel and cargo is always a challenging task. Arrival and departure times strongly depend on the climate conditions and on the logistic circumstances.

After the long Antarctic winter the VLBI equipment at the station has to be initialized. Damages resulting from the winter conditions or strong storms have to be identified and repaired. Shipment of each kind of material, like spare parts or upgrade kits, has to be carefully prepared in advance.

On location of the site the following instruments are operated:

- a H-Maser, an atomic Cs-clock, a GPS time receiver and a Total Accurate Clock (TAC) offer time and frequency.
- two GNSS receivers both operating in the frame of the IGS network, while one receiver is additionally part of the Galileo CONGO network. The receivers worked without failure in 2012.
- a meteorological station providing pressure, temperature and humidity and wind information, as long as the temporarily extreme conditions did not disturb the sensors.

- a radar tide gauge which was installed in 2012. The radar sensor itself is space referenced by a GPS-antenna mounted on top and Earth referenced via the local survey network. The radar gauge is operated only during the Antarctic summer.
- an underwater sea level gauge for permanent monitoring of water pressure, temperature, and salinity, which was replaced in 2012.

The 9m radio telescope is designed for dual purpose:

- performing geodetic VLBI and
- receiving data from and sending commands to remote sensing satellites, mainly ERS-2 and TanDEM-X.



Figure 1. The 9m radio telescope of GARS O'Higgins.

## 2. Technical Staff

The members of staff for operation, maintenance and upgrade of the VLBI system and other geodetic devices are summarized in table 1.

Table 1. Staff – members

Name	Affiliation	Function	Working for
Johannes Ihde	BKG	interim head of the GOW (till February 2012)	GOW
Ulrich Schreiber	BKG	head of the GOW (since March 2012)	GOW
Christian Plötz	BKG	electronic engineer	O'Higgins (responsible), RTW
Christian Schade	BKG	geodesist	O'Higgins operator, SLR
Reiner Wojdziak	BKG	software engineer	O'Higgins, IVS Data Center Leipzig
Andreas Reinhold	BKG	geodesist	partly O'Higgins operator
Thomas Klügel	BKG	geologist	administration for O'Higgins, laser gyro and local systems Wettzell
Rudolf Stoeger	BKG	geodesist	logistics for O'Higgins
Alexander Neidhardt	FESG	head of the RTW group and VLBI station chief	RTW, TTW (partly O'Higgins, laser ranging)
Gerhard Kronschnabl	BKG	electronic engineer	RTW, TTW (partly TIGO and O'Higgins)

### 3. Observations in 2012

GARS participated in the following sessions of the IVS observing program during the Antarctic summer campaign (January-March 2012)

- IVS-T2081 February 14. - 15., 2012
- IVS-OHIG76 February 15. - 16., 2012
- IVS-OHIG77 February 28. - 29., 2012
- IVS-OHIG78 February 29. - March 01., 2012

The observations were recorded with MK5A. The related data modules were carried from O'Higgins to Punta Arenas by the staff on their way back. From Punta Arenas the disk units were shipped by regular air freight back to Wettzell and then to the correlator in Bonn, Germany.

### 4. Maintenance

The extreme environment conditions in the Antarctic require special attention to the GARS telescope and the infrastructure. Corrosion frequently results in problems with connectors and capacitors. Defective equipment needs to be detected and replaced. The antenna, the S-X-band receiver, the cooling system and the data acquisition system has to be activated properly. A COM-server was replaced by a RS232 converter. The existing GNSS receiver Leica GRX1200GGPRO was replaced by another Leica GRX1200+GNSS. A problem are the low transfer rates (often with only 50 kbps) on the communication connection, so that the Internet and phone access was reduced. Also the Web cams are regularly maintained.

The defective tide gauge was dismantled. A new system was tested in the workshop and installed in cooperation with the Chilean military base and the service team of the DLR. The radar tide gauge was installed for the time of the campaign and dismantled before the Antarctic winter.

The construction of the new dewar is in progress in order to replace the original O'Higgins dewar. This one has to be evacuated permanently by a turbo molecular pump to maintain the required vacuum due to a leakage.

### 5. Technical improvements

The new Symmetricon NTP-server was installed and put into operation. A new meteorological mast was raised and populated with the required sensors. A new data logger for the meteorological data was put in operation. The new meteorological station was also integrated into the automated data acquisition, graphical interfacing and NASA Field System.

The remote control of complete VLBI-sessions could be extended. Using the newly developed Wettzell software the O'Higgins field system can be controlled over a secure internet connection from Wettzell. This is a key feature to extend the operation periods in GARS O'Higgins.

A new NAS server was installed and activated.

## **6. Upgrade plans for 2013**

The replacement dewar will be completed. A dedicated plan should offer a shared, interleaved observation of satellites (DLR) and VLBI sources (BKG) during the whole year. Some antenna motors must be replaced and a gear needs to be inspected. There are further plans to replace the receiver with a more suitable, smaller and better maintainable system, similar to the TWIN tri-band-receiver. This needs to be planned and designed.